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Injured fingertip remodeling through percutaneous collagen induction

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Abstract

Scarring at the level of the fingertip can cause major problems and discomfort. We report a case of a professional bass player who suffered impaired functionality of his middle finger after surgical treatment of a felon. We performed a collagen induction therapy after plastic reconstruction of the middle finger's fingertip with an adipofascial turnover flap and two lateral VY flaps. This resulted in a long-term improvement of the previous symptoms and full functional rehabilitation as musician with an esthetically pleasing result.

Keywords: Fingertip reconstruction; Fingertip remodeling; Percutaneous collagen induction; Scar remodeling

1. Introduction

Lesions of the fingertip are delicate regions in terms of reconstruction, especially when it comes to the reconstruction of full functionality with grip, feeling and strength. Infections as well as partial or full amputations frequently call for surgical interventions. Reconstructive techniques and success are limited by the anatomical restrictions such as tiny vessels and little soft tissue. We therefore like to present a case report of a combination of surgical measurements that offer encouraging results.

2. Case report

A 47-year-old patient presents himself with impairment and pain of the right middle finger. He reports a felon at the fingertip in 2005, which had received ambulatory surgical treatment elsewhere. Ever since the patient suffered from pain in the area of the scar with severe impairment of the functionality of the fingertip and the palmar gripping point, conservative treatment regimen did not lead to any improvement.

The examination shows a y-shaped contracted scar at the palmar fingertip with insufficient soft tissue coverage of the tip (see Fig. 1). The scar runs from the radial side over the tip to the counter-gripping point of the thumb.

Our patient works as a professional bass player – the unrestrained functionality of the middle finger is essential for the picking hand and therefore the exertion of his practice. Since the infection and operation the middle finger is of almost no professional use anymore which was associated with severe personal and professional constraints.

Therefore, the patient agreed on an operative revision of the scar in March 2008, three years after initial surgical treatment of the felon.

Surgery was performed in Oberst's regional anesthesia and finger tourniquet. After excision of the scar two VY Kutler flaps were designed and prepared (Fig. 2). After the mobilization of the flaps it showed that the defect couldn't be completely covered. Therefore, an adipofascial

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Figure 1. 47 y patient with scar of the fingertip of right middle finger after felon surgery.

Figure 3. First postoperative result after adipofascial turnover flap and two lateral VY Kutler flaps.

turnover flap was prepared from the palmar fingertip. The end result initially showed an improved shape and contour of the finger tip with a sufficient pad of soft tissue beneath and in the area of the nail tuft (Fig. 3).

After this first intervention the patient was satisfied with significant improvement at hand. The patient was able to continue his profession as a bass player to a large extent. None the less he reported in a check up in 2010, that in some situations the finger tip still proofs to be restrained by the scarring which renders the finger useless at times, especially when playing the upright double bass. The examination showed again an overall contracture of the scar area with impairment of the fine motor skills. We therefore suggested a percutaneous collagen induction (PCI) therapy to smoothen and soften the scar.

This procedure was performed in August 2010 under local anesthesia. We used a 3 mm needled roller for the high frequency microneedle perforation of the skin at the fingertip. This was continued until sufficient bleeding in the area of the scar showed. Already at this point a relevant softening of the skin was palpable. During the operation vitamin-A-oil was administered. The patient was requested to continue the vitamin-A-oil application at home every 3 h for the following 24 h. From the second postoperative day on the oil was applied twice a day for another six weeks. The resumption of his work was postponed for one week and he was asked to avoid sun exposure of the treated area.

After this second treatment the patient was very pleased with the result. He was able to perform on his bass within his profession with almost no restraints. Another check up in February 2014 showed a visible yet smooth scar at the fingertip with no palpable contractures (Fig. 4). The padding of the tip and nail tuft is good and no pigment changes in the skin are detectable. The patient is very satisfied with the esthetical and functional result and claims that he regained 80% of his finger's functionality. The two-point discrimination fully recovered at 6 mm.

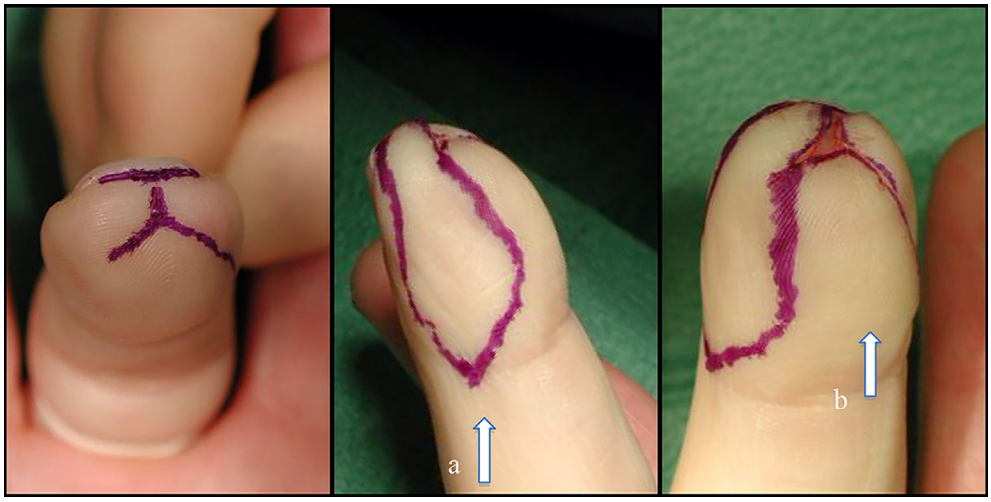

Figure 2. Incisions for scar resection and the two lateral Kutler VY flaps (a) and the adipofascial turnover flap (b).

Figure 4. Fingertip after 3½ years post intervention.

3. Discussion

Exact data on problems with scars after surgical interventions in felons do not exist, yet most likely depend on the localization. Scar related ailments in the area of the fingertips often show a pathologically altered sensibility, especially when it comes to cold temperature reception (Aust et al., 2010a).

The problems of our patient based on the localization of his scar directly at the gripping point of the middle finger's tip and his profession are quite unique in this regard.

The resection of the scar in the affected area creates a tissue deficit – the coverage of which poses a challenge due to the anatomy with little soft and skin tissue available (Brun et al., 2012) for plastic reconstruction. Most of the procedures described for coverage of the distal finger and or tip derive from traumatic amputations. They are classified by Allen (Allen, 1980) in 5 levels. Level 1 describes a distal amputation without the involvement of the fingernail whereas levels 2–5 differentiate the amputation in relation to the fingernail. Several studies have shown very good results for plastic reconstruction with two lateral VY Kutler flaps for amputations up to level 3 (Brun et al., 2012; Aust et al., 2008). This is equally the case for the preservation of sensibility at the fingertip (Aust et al., 2008). Even though we did not deal with an amputation in this case, the two VY flaps did not guarantee a sufficient padding of the fingertip even after extensive mobilization. This is why we decided to add an adipofascial turnover flap from the palmar part of the middle finger, which has been described as a technique with good esthetic and sensory outcomes (Fabbrocini et al., 2014). Despite the initially satisfying result our patient ended up with a relapse of the disturbing scar even though the soft tissue situation had improved. Due to our previous positive experiences with percutaneous collagen induction therapy that had been developed in the meantime, we proposed this as an alternative treatment option. PCI was described in 2008 as an alternative treatment for scars, wrinkles, and skin laxity (Ameziane et al., 2002). The main concept of PCI or medical needling is to disrupt the collagenous structure of scarred or wrinkled skin at the level of the papillary dermis with a needled roller device that is applied with pressure horizontally, vertically and diagonally. This triggers a natural posttraumatic inflammatory cascade, which leads to the replacement of the scar collagen with new collagen. The post-procedural as well as the pre-procedural application of oil containing Vitamin A supports the initial release of growth factors and collagen production (Ameziane et al., 2002; Aust et al., 2011; Fabbrocini et al., 2012). The efficacy of PCI has been demonstrated both in experimental settings as well as in first clinical settings (Aust et al., 2010a,b). One of the main advantages over other alternative treatment options like laser and needling is the lack of thinning of the skin due to the treatment. The encouraging result from this particular case confirms the positive effect of PCI on scar tissue.

In summary we conclude that PCI is a viable therapy option for patients with scar related problems also and especially in delicate anatomical regions such as fingertips and could be used early on in selected patients.

Conflict of interest

None declared.

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